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Drilling Down on Royalties: How Canadian Provinces Can Improve Non-Renewable Resource Taxes

Many Canadian provinces levy distorting taxes on resource producers. There is a better way to both raise more revenue and encourage investment.

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The Study In Brief

From coast to coast, non-renewable-resource taxation is a key source of provincial government revenue – and political rancour. Alberta has recently started a comprehensive review of its oil and natural gas extraction tax system. Newfoundland and Labrador is looking at a redesign of its royalty system. And British Columbia has set up a new tax on liquefied natural gas production.

These provinces can all improve their current resource tax systems to raise more money without jeopardizing investment. The key problem with current resource taxes in Canada is not the tax rates, but the design of the taxes. Canadian policymakers should be looking at international best practices in resource tax design. Australia and Norway have best-in-class resource taxes that are based on the cash flows of resource production. That better design means that resource companies in those countries pay a high tax rate on cash flows but still have a strong incentive to invest.

Western Canadian provinces instead rely on economically distorting gross-revenue royalties for most onshore oil and gas taxation. These provinces should change their gross-revenue royalties to more efficient cash-flow taxes. Cash-flow taxes are a better way of reflecting the cumulative costs that resource companies face to extract energy than are gross revenue royalties.

Although Alberta's oil sands cash-flow tax and Newfoundland and Labrador's offshore royalty follow many international best practices, both have room for improvement. Those provinces should rethink the rules around how companies pre-pay gross revenue royalties, the limits on the kinds of expenses companies can deduct, and having a royalty rate that fluctuates with oil prices.

British Columbia's mining tax hits many of the right notes. However, the province's tax on liquefied natural gas exports would be unnecessary if it changed its gross-revenue royalties on natural gas extraction to cash-flow taxes. Likewise, the federal government should consider reforms to its own corporate income tax system to tax cash flows, not profits.

Canadian provinces have collected about $79 billion in resource-specific tax revenues from 2009 to 2013. But the provinces can collect more while not harming investment in mining and oil and natural gas extraction if they change their distortive gross-revenue royalties into better designed cash-flow taxes.

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Natural resources are a vital revenue source for several provincial governments. As well, resource revenues have an important advantage when compared to non-resource tax revenues: governments can, in principle, collect them with little economic cost.

Indeed, governments around the world, including a few in Canada, have put into practice well-designed resource taxes that are economical to collect.[1] However, most provincial tax systems for mining, oil and natural gas are not well designed. As a result, these taxes impose distortions on resource investments, dissuading companies from exploration, development and extraction. That means less potential resource revenue to collect.

Resource taxation has emerged as one of the key policies affecting Canada's energy sector. And as the new Alberta government embarks on a comprehensive review of its approach, policymakers there should focus on improving the design of resource taxes. But Alberta is not alone in considering changes to its resource-tax regime. Newfoundland and Labrador is promising a review (Canadian Press 2015) while British Columbia is setting up a new taxation system for liquefied natural gas production. Properly instituted, these provinces, as well as others with resource-tax systems, can implement reforms to maximize their share of "above-normal" resource profits without jeopardizing investment.

Why Tax Resources?

The case for taxing natural resources rests on the notion that they are commonly owned public property. Accordingly, resource revenues reflect the legitimate exercise of provincial rights with respect to such property. Common ownership, however, is not a precise concept. The Constitution of Canada recognizes the right of the provinces to manage resources within their boundaries and to impose resource taxes. However, the federal government also has the right to levy general income taxes that apply to resource industries.

Clearly, provincial residents can exercise their property rights by imposing resource taxes through their government. However, future residents also have some such claim. Provinces can respond to this claim by setting aside some resource revenues in a sovereign wealth fund for future use or by requiring that some resources remain in the ground.

Still, how governments save and spend resource wealth need not affect the design of a resource-tax system. Nor should governments add environmental or industrial policies to resource

This paper draws on work done with Michael Keen of the International Monetary Fund on the principles of designing efficient non-renewable resource taxation (Boadway and Keen 2010, 2015). The authors wish to thank David Daly, Finn Poschmann, Alex Laurin, Kevin Milligan, attendees of a C.D. Howe Institute Energy and Resources Policy Council meeting, and several anonymous reviewers for comments on earlier drafts. The authors retain responsibility for any remaining errors and the views expressed here.

1 Relevant sources include Australia Treasury (2010), Boadway and Keen (2010, 2015), Gaudet and Lasserre (2015), Garnaut and Clunies-Ross (1975) and Lund (2009, 2014).

tax systems when such issues could be addressed more directly through other means (although environmental policies may impinge on the costs of resource production and thus the resource tax base). Instead, resource taxation systems should concern themselves only with getting the maximum value out of the physical energy and resource assets buried under ground without discouraging the investment and effort required to find and extract such assets.

Ideally, resource taxation applies to only above-normal returns (if the cost of capital is, say, 5 percent, an above-normal rate of return would be, for example, 15 percent), which economists and policymakers refer to as rents. This concept of rents is critical for our discussion. Annual rents from the production and sale of natural resources include all revenues from resource sales less all current and capital costs accrued in the year. Those expenses include exploration, development, extraction and initial processing. They should also include the full, risk-adjusted imputed costs of using capital and resource assets.

A key problem for policymakers is that rents are not readily observable. The challenge is how to devise a taxation scheme that is equivalent to a tax on rents or above-normal returns. Typically, governments use annual cash flows, that is, revenues less costs, to establish such a tax base. The present value of cash flows is the same as the present value of rents, but is much easier to measure. In what follows, when we talk of resource rents, we have in mind a resource firm's cash flows.

There are many other features of resource production that complicate tax design. The path from exploration to processing is both lengthy and risky. There is risk both because the results of exploration are uncertain and because the final resource price is volatile. Other relevant costs include environmental costs (including environmental pricing policies), costs of closure or abandonment, and payments for access rights to the owners of the land surface above resources. There is additional risk in that resource companies are not fully vertically integrated, making their failure rate significant, especially at earlier stages.

Tax policies need to be long-lasting and should price risk properly. They should account for the costs of exploration even if companies fail to produce from oil and natural gas or mining projects. Indeed, unsuccessful exploration may be socially beneficial as it can provide valuable information to other firms, which is all the more reason for not discouraging it.

Taxation is also complicated by intra-firm dealings, such as within multinationals, which makes project-based taxation difficult to enforce. Effective taxation requires that the tax authorities be able to monitor producers' tax bases. That may be difficult, especially for multinational resource firms.

Finally, today's governments cannot commit future governments to their policies. This leads to political risk, which can discourage long-term investment and constrain resource-tax policies.

How to Reform Resource Taxation in Canada

In this *Commentary*, we review current and international best practices in resource taxation. In sum, we make the following recommendations.

(1) Canadian governments should replace economically distorting gross-revenue royalties – such as those in Alberta for conventional oil and natural gas resources – with more efficient rent-collecting cash-flow taxes. Cash-flow taxes better reflect resource companies' cumulative costs than do gross-revenue royalties. Under a cash-flow regime, barely profitable projects would face little or no tax, while highly profitable projects would pay a heavier tax. Canadian provinces should base their resource taxation on a combination of resource-right auctions and cash-flow taxes.

(2) Those governments that do have cash-flow taxes in place – such as Alberta for the oil sands and

Newfoundland and Labrador for offshore oil – should reform their regimes to better match best international practices. For example, full loss-offsetting should be the norm rather than the exception. Many Canadian mining-tax regimes – such as that in BC – offer examples of good, albeit still imperfect, practices. Canadian governments should also look at the successful and unsuccessful elements of the Norwegian and Australian resource taxation systems.

(3) There should be no special tax on liquefied natural gas plants, such as proposed by BC, given that a rent tax can be applied on the exploration and extraction stages. These plants should be treated like other non-resource corporations.

(4) Governments, with the federal government in the lead, should pursue a more ambitious complement to rent taxes for the resource industries by changing economy-wide corporate taxes and personal taxes on unincorporated business income to rent taxes at both the federal and provincial levels. Business taxes could be transformed into rent taxes relatively easily by introducing a deduction for equity finance and ensuring that loss-offsetting applies, as discussed in Boadway (2014) and Milligan (2014).

Resource Taxation in Canada and Around the World

As noted, resource industries are subject to federal and provincial income taxes as well as provincial resource taxes. Income taxes are generally harmonized between the two levels of government, either by tax collection agreements or, informally, where provinces maintain separate corporate income tax systems (Alberta, Quebec). Resource taxes vary by province and type of resource and are collected with virtually no inter-provincial harmonization.[2]

Federal and Provincial Corporate Income Taxes

Corporate taxes apply roughly to the return on shareholder equity, which includes both a normal risk-adjusted return and any above-normal returns, or rents. The corporate income tax base includes revenues less current and capital costs, all on an accruals basis. Currently, the federal corporate income tax rate is 15 percent, while provincial rates vary from 11 percent in BC to 16 percent in Nova Scotia and Prince Edward Island.

Capital costs include depreciation, recognized through a capital cost allowance for depreciable property, and interest payments. Resource industries benefit from three additional capital cost deductions: the Canadian Exploration Expense (100 percent), the Canadian Development Expense (30 percent) and the Canadian Oil and Gas Property Expense (10 percent).

Meanwhile, provincial resource taxes are deductible from the corporate tax base.[3] Resource corporations can also take advantage of the federal Scientific Research and Experimental Development tax credit, flow-through share financing, as well as myriad other provincial and federal tax measures that we do not discuss here.

2 We do not include municipal taxation of resources, which have become an increasingly large share of total taxes paid by resource companies, particularly in Alberta. See Conger and Dahlby (forthcoming) for more details.

3 However, unlike royalties, resource development rights as part of a bonus bid are only partially deductible. As of 2011, the federal tax code treats all acquisition costs of new leases as oil and gas property expenses (Baruffaldi and Tetzlaff 2012).

Provincial and Territorial Resource Taxes

There is some overlap between provincial or territorial corporate taxes and profit taxes on mining and non-conventional and offshore oil and natural gas. The profit tax approximates a rent tax, while the corporate tax applies both to rents and to normal risk-adjusted returns to investment. Despite their obvious similarities, there is no harmonization of resource taxes and corporate taxes (other than the deductibility of provincial resource taxes from the corporate tax base), and there is no common tax administration. The Canada Revenue Agency administers the corporate tax for most provinces, but provinces administer their own resource-tax regimes. Most provincial onshore petroleum resource taxes apply to a share of gross revenues of production, which we refer to in this *Commentary* as a gross-revenue royalty as distinct from resource taxation more generally. (See Table 1 for a summary of resource-tax regimes).

Mining Taxation

Provincial mining taxes vary widely, but share some common features. The typical tax base is some notion of profits – revenues less operating and capital costs – where the latter include depreciation, exploration and development costs. The write-off rates for exploration and development are often rapid, and sometimes more than 100 percent, although the costs of acquiring mining properties, including gross-revenue royalties to property owners, are usually not deductible. Interest is also often not deductible.

Governments sometimes use a two-tiered tax-rate system, with lower rates applying early on, or until companies recover their costs. As well, they sometimes levy gross-revenue royalties on the value of output, amounts then creditable against future provincial mining tax liabilities. These upfront gross-revenue royalties are like withholding or minimum taxes that allow the provincial government to obtain revenue earlier than would be the case with profit taxation alone. Firms are typically able to carry forward losses without interest.

If resource firms are acquired, any tax losses become assets that the buying firm can apply against income from assets taken over. However, these tax losses, including any first-stage gross-revenue royalties, are not refundable, except in Quebec.

Lastly, some provincial governments provide processing allowances to firms to encourage processing activity in the province.

Overall, mining taxes approximate taxes on cash flows, but with imperfect loss-offsetting. This means that they apply roughly to both rents from the resources and the normal return on profitable risk-taking initiatives. Meanwhile, provincial rates of mining-profit tax are low from the point of view of obtaining maximum rents by government. Given the absence of full loss-offsetting and progressive two-tiered rate structures, provincial mining taxes would seem to discourage risk taking. However, this is partly offset by the generous treatment of exploration and development.

The BC net-revenue mining tax, upon which the province's liquefied natural gas facility tax is based, is of particular interest because it resembles an efficient resource-rent tax. The base of this net-revenue tax is a mine's cash flows, but without refundability of negative cash flows. Firms carry forward losses in an account, with an assumed financing cost (called an investment allowance) of 1.25 times the federal bank rate. The tax rate is 13 percent, but BC also imposes an annual minimum tax of 2 percent on net current proceeds (revenues less operating costs) that firms credit against future mining taxes. Firms carry the net-current-proceeds tax forward with interest (at the same interest rate as above) indefinitely, but they cannot refund losses in the event the mine winds up. Note that the 13 percent net-revenue tax rate is relatively low for a rent tax.

Looking at international examples, in Australia, a Labour government implemented a federal resource rent tax in 2012 with a tax rate of 40 percent. The tax proved very controversial, especially with the

Table 1: Resource Tax Rates and Design, Select Jurisdictions

	BC		Alberta			Saskatchewan	Newfoundland	Norway	Australia
	Mining	**Natural Gas**	**Natural Gas**	**Oil**	**Oil Sands**	**Oil**	**Offshore Oil**	**Offshore Oil**	**Oil (Federal)**
Tax Ratio									
Minimum %	2 (gross)	0	5	0	1-9 (gross)	0	1-10 (gross)	N/A	N/A
Maximum %	13 (net)	27	36	40	25-40 (net)	30	20-50 (net)	51	40
Rate subject to:	Fixed in pre- or post-payout stage.	Price of product; age, region and productivity of well; deduction by depth of well.	Maximum rate depends on price of product and productivity of well; wells at low rate with production threshold level based on depth of well.		Price of oil for both gross-revenue and net royalty.	Price of product; age, region and productivity of well; deduction by depth of well.	Gross-revenue rate subject to production level; net rate based on profit threshold.	Fixed rate on resource company profits.	Fixed rate on resource profits plus state taxes.
Tax Design									
Tax type.	Cash flow.	Gross-revenue royalty.	Gross-revenue royalty.		Gross-revenue plus cash flow royalty post-payout.	Gross-revenue royalty.	Public participation (5 to 10 percent) plus gross-revenue royalty plus cash flow.	Public participation (20 to 60 percent) plus cash-flow tax.	Resource rent.
Loss carry-forward allowed.	Yes (except on windup).	No.	No.		Yes (except on windup).	No.	Yes (except on windup).	Full.	Yes (on windup, within company only).
Interest rate used for loss carry-forward.	1.25 times the federal bank rate.	N/A	N/A		Long-term bond rate for return allowance (2014 year end: 2.73 percent).	N/A	5 percent plus long-term bond rate for pre-development costs; no interest on gross-revenue royalties paid.	Risk-free rate determined by Ministry of Finance.	5 to 15 percentage points above government long-term bond.
Allowable cost and processing allowances.	Direct operating costs, gross-revenue royalties incurred and an allowance for costs of, and a return on, capital assets.	Allowance for field gathering, dehydration, compression, field processing and conservation.	Deduction for gathering, compressing and processing gross-revenue royalty share.	No widely available allowances.	Costs to recover, obtain, process, transport or market oil; gross-revenue royalty; reclaim or abandon project and comply with environmental laws.	Cost of transporting oil from well to point of sale.	Approved operating, capital, overhead and successful development costs.	All exploration, abandonment, capital and financial costs with uplift.	Exploration, capital and operating expenditures.

Sources: Authors' interpretation of http://www.industry.gov.au/resource/Enhancing/ResourcesTaxation/Pages/default.aspx, http://www.qp.alberta.ca/documents/Regs/2008_231.pdf, http://www.energy.alberta.ca/OilSands/pdfs/Royalty-Guidelines-2015.pdf, http://www.sbr.gov.bc.ca/business/Natural_Resources/Mineral_Tax/MinTax_Handbook.pdf, http://assembly.nl.ca/Legislation/sr/regulations/rc030071.htm, https://www2.deloitte.com/content/dam/Deloitte/global/Documents/Energy-and-Resources/gx-er-oil-and-gas-taxguide-norway.pdf, http://www.energy.alberta.ca/About_Us/Royalty.asp, http://www.nr.gov.nl.ca/nr/energy/petroleum/offshore/offroyalties.html, G.C. Watkins (2001) and Alberta Energy (2011).

largest mining companies. The tax rate was reduced to 30 percent and was rescinded in 2014 when the Liberals replaced Labour.

Oil and Natural Gas Taxation

Provincial oil and natural gas taxes differ between, on the one hand, conventional oil and natural gas, and oil sands and offshore oil on the other.

Conventional Oil and Natural Gas Taxation

Provinces collect revenue from conventional oil and natural gas – which includes horizontal drilling and hydraulic fracturing – in two main ways: sealed bonus-bid auction leases and gross-revenue royalties. Companies purchase leases from the government granting them the right to explore and extract resources, variously known as tenure rights or bonus bids.[4] Meanwhile, provincial gross-revenue royalties are based on the value of production, with the royalty rate varying from zero to 40 percent, depending on price, productivity and age of wells. Some gross-revenue royalty systems provide deductions for costs (such as natural gas processing costs in BC and Alberta), but these are not as comprehensive as those in cash-flow regimes.

Compared to rent taxes, gross-revenue royalties are not as difficult to administer and to enforce project by project. They avoid the need for governments to verify costs, which might be difficult for provincial tax authorities. Still, provinces require ongoing monitoring, assessing and auditing of gross-revenue royalty payments.

Broadly speaking, gross-revenue royalties entail disproportionate risk for private producers since they tax risk-laden returns on the upside without giving full relief on the downside, given that the royalty rates tend to vary positively with resource prices. On the other hand, one can argue that the sensitivity of gross-revenue royalties to price and productivity allows for a rough approximation to profits (Carr and Livernois 2012).

However, gross-revenue royalties distort business decisions in many ways. The absence of loss offsetting discourages exploration. That is because companies might decide not to explore or produce marginal projects. They might also decide to shut down production earlier than otherwise because of the additional burden of paying taxes for a barely profitable project. Gross-revenue royalties are also prone to commitment problems; that is, to discretionary changes in rates when resource prices increase.

Oil Sands and Offshore Oil Taxation

Alberta's oil sands taxation combines gross-revenue royalties and cash-flow taxation of profits (or resource-rent taxation), and applies in two stages. In the first stage, a gross-revenue royalty of between 1 percent and 9 percent is imposed, depending on the oil price. The first stage lasts until total revenues exceed setup costs. After that, the tax is the greater of a) between 25 percent and 40 percent of cash flows or b) between 1 percent and 9 percent of revenues, depending on the oil price.

Offshore oil taxes in Newfoundland and Labrador are also similar to a resource rent tax. In addition, the province has historically collected additional revenue by owning a small share of resource projects through Nalcor Energy, a provincial Crown corporation. However, the tax rates differ by project. For example, oil from Hibernia is subject to a two-tier net royalty. The province applies a rate of 30 percent to cash flow after a company achieves a 15 percent rate of return. There is an additional 12.5 percent tax after the company reaches an 18 percent return. The most recent extension

4 For more details, see Busby, Dachis and Dahlby (2011).

is subject to a top net royalty of 50 percent. In addition, there is a basic gross-revenue royalty that increases from 1 percent to 5 percent of gross revenues. However, other projects have basic royalties that go up to 10 percent, and have minimum net royalties as low as 20 percent.[5] The return allowance varies by project, ranging from 10 percent plus inflation to 18 percent plus inflation. Firms can credit their basic gross-revenue royalty against the net royalty, so the gross-revenue royalty acts as an advance payment, albeit without interest on past gross-revenue royalties and without refundability in the case of windup.

Other countries take different approaches to sharing resource riches. Norway relies on a combination of public participation, usually 20 percent although as high as 60 percent in past petroleum leases. On top of the equity stake, Norway collects a 51 percent cash-flow tax and a general corporate income tax. Company expenses are fully deductible, even upon windup, and companies can carry forward these expenses indefinitely, albeit only at the risk-free rate set by the government.

In Australia, the federal government mineral resource rent tax was based on a pre-existing petroleum resource-rent tax. While the original petroleum resource-rent tax applied to offshore oil and natural gas projects, the government in 2012 extended it to onshore oil. Unlike the mining tax, it has remained in place.[6] The current petroleum resource-rent tax provides a generous carry-forward rate (15 percentage points above the long-term government bond rate) for exploration expenses. However, it has a relatively narrow scope of deductible expenses and at a lower interest rate.

Finally, BC's proposed tax treatment of liquefied natural gas plants is unique because it would be a standalone tax on the processing of resources alongside a separate tax on extraction. It would be similar to a resource-rent tax, but firms would be allowed to carry forward losses without interest and would not have full loss-offsetting. Firms would be able to deduct the cost of natural gas they use as an input. That would mean the government would only tax rents from processing, not rents from extraction. It is unusual in being a standalone tax on the processing of resources alongside a separate tax on extraction.

Government Revenues from Mining and Oil and Natural Gas

Canadian governments collected about $79 billion in resource-specific revenues from 2009 to 2013, $15 billion of which came in 2013.[7] $75 billion of those revenues came from natural gas, conventional oil and bitumen from oil sands, with mining taxes accounting for the remaining $4 billion. Alberta, BC, Saskatchewan and Newfoundland and Labrador collected over 90 percent of total oil and natural gas revenue.

Alberta

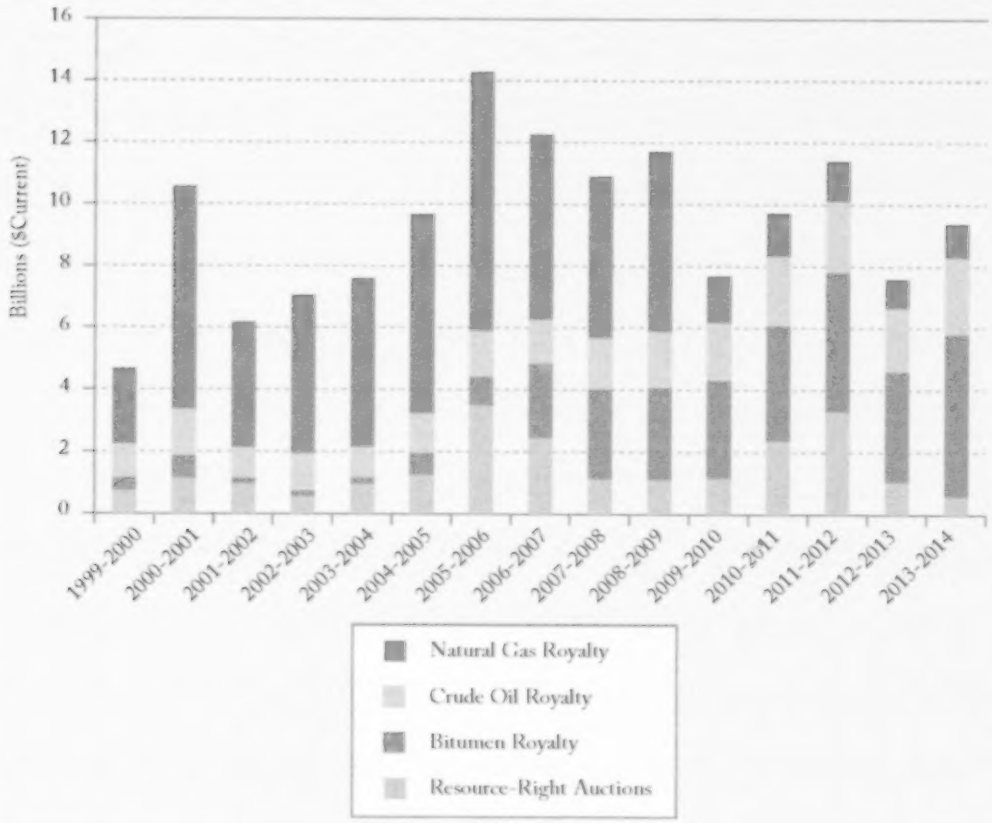
The province most dependent on resource taxation is Alberta. Taxes on non-renewable resources represented 21.8 percent of total revenues from

5 See, for example, project-specific agreements at http://www.nr.gov.nl.ca/nr/energy/petroleum/offshore/offroyalties.html.

6 See Australia (2014) for more details.

7 This five-year national total is a Natural Resources Canada estimate based on data from Statistics Canada, the Canadian Association of Petroleum Producers (CAPP) and the Mining Association of Canada. In what follows, we report data on fiscal years for Alberta based on that province's public accounts. However, we report data in graphs for the rest of Canada on a calendar year basis using data from the Canadian Association of Petroleum Producers. We report resource revenue shares of total government revenues on a fiscal-year basis.

Figure 1: Oil and Natural Gas Revenues in Alberta, Fiscal Years 1999/2000 – 2013/2014



Note: Dollar amounts are for fiscal years.

Source: Authors' calculations from Alberta Public Accounts.

fiscal years 2009/2010 to 2013/14. Over those years, Alberta collected $20.2 billion in resource taxation from bitumen, $10.9 billion from conventional crude oil, $8.5 billion from natural gas and $6.3 billion from resource-right auctions. (Previously, natural gas gross-revenue royalties were the primary resource-tax source, as seen in Figure 1).

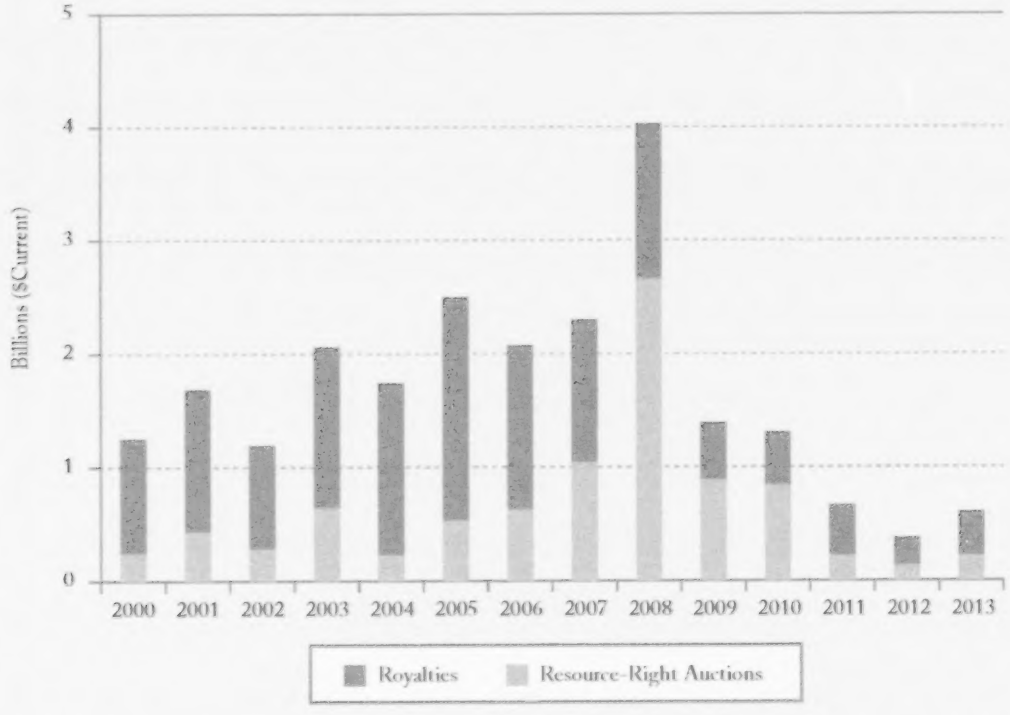
British Columbia

From 2009 to 2013, BC collected $2.3 billion from resource-right auctions and a further $2 billion from gross-revenue royalties (Figure 2). Much of the revenue came from natural gas. Total non-renewable resource revenues, which include mining taxes, averaged 4 percent of total provincial revenues between fiscal 2009/2010 and 2013/14.

Saskatchewan

From 2009 to 2013, Saskatchewan collected $1 billion in resource-right auctions and $9.3 billion from gross-revenue royalties (Figure 3). Oil and natural gas revenues provided 17.5 percent of

Figure 2: Oil and Natural Gas Revenues in British Columbia, 2000-2013



Source: Authors' calculations from CAPP.

Saskatchewan's revenues from the 2009/2010 through 2013/14 fiscal years.

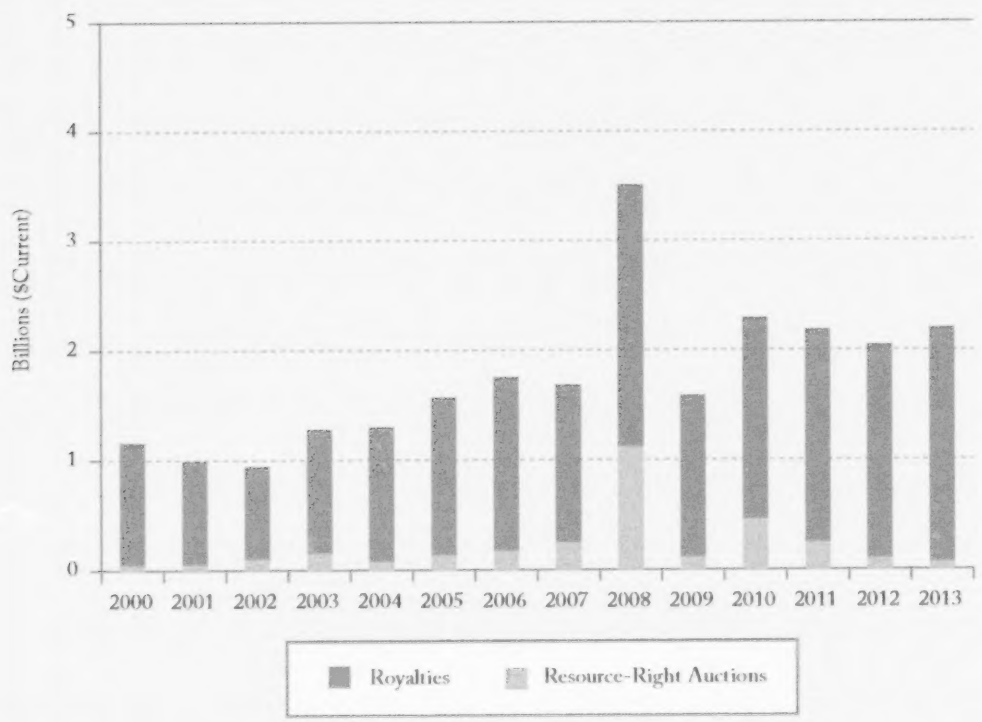
Newfoundland and Labrador

Offshore oil revenues are the primary resource-revenue source in Newfoundland and Labrador. From 2009 to 2013, the province collected $600 million in resource-right auctions compared to $12.2 billion in offshore royalty revenues (Figure 4). Offshore royalties represented about one-third of total provincial revenues from the 2009/10 through the 2013/14 fiscal years.

The Rest of Canada

While other provinces and territories have some oil and natural gas resource production, it pales compared to the above-listed provinces. Nova Scotia has collected slightly over $600 million in offshore natural gas production royalties since 2009. Meanwhile, Manitoba has seen an increase in the last three years of oil taxes related to shale oil production, with total royalties since 2009 coming in at about $900 million. Combined, provinces and territories other than Alberta, BC, Saskatchewan and Newfoundland and Labrador collected $2 billion in resource-right auctions and $1.7 billion in resource revenues between 2009 and 2013 (Figure 5).

Figure 3: Oil and Natural Gas Revenues in Saskatchewan, 2000-2013



Source: Authors' calculations from CAPP.

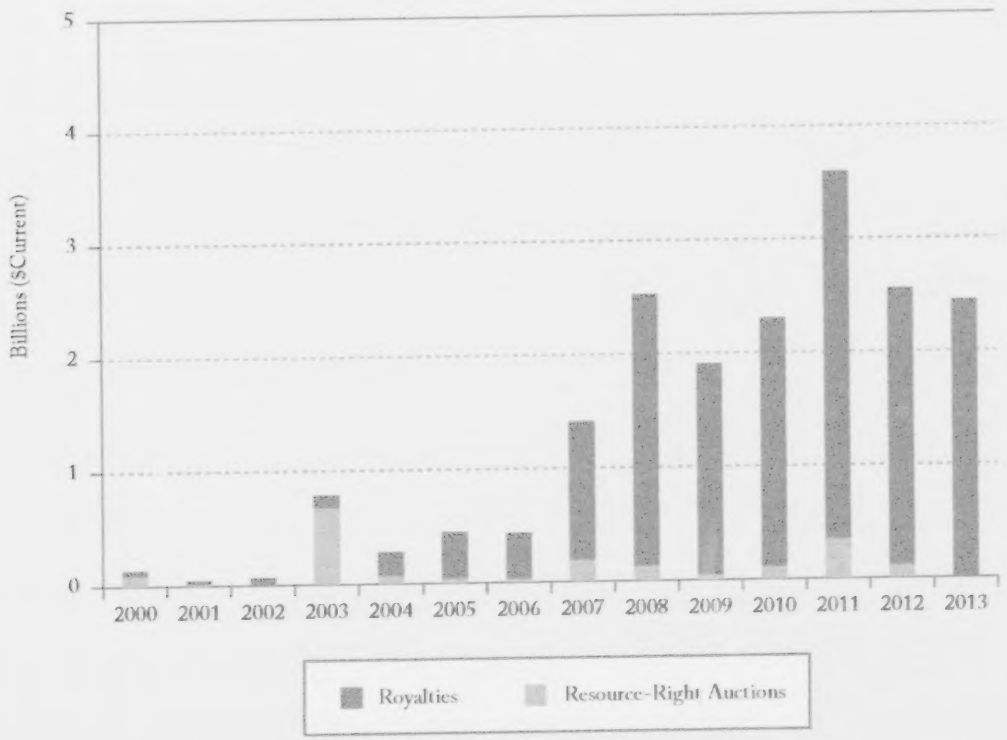
Best Practices in Resource Taxation

The objective of resource taxation is to capture the maximum share of natural resource rents as efficiently as possible. But do Canadian taxes fit that bill? Rents represent the economic value of non-renewable natural resource revenues less the full opportunity cost of finding, developing and extracting the resources. Rents accrue over long periods, and their valuation is complicated by the fact that they are uncertain. Moreover, obtaining rents involves large initial investments in exploration and development – a significant proportion of which will be unproductive – in return for generating future revenue streams.

Taxing rents is difficult, because they are unobservable or hard to measure as they accrue. There are, however, various taxes and other revenue mechanisms that are roughly equivalent to proper rent taxes in present-value terms, none of which is perfect. Three revenue approaches we discuss are:

Auctions: In principle, competitive auctions for the right to explore, develop and extract resource properties capture all expected rents, adjusted for the cost of risk, as well as accounting for expected future taxes and political uncertainty.

Figure 4: Oil and Natural Gas Revenue in Newfoundland and Labrador, 2000-2013



Source: Authors' calculations from CAPP.

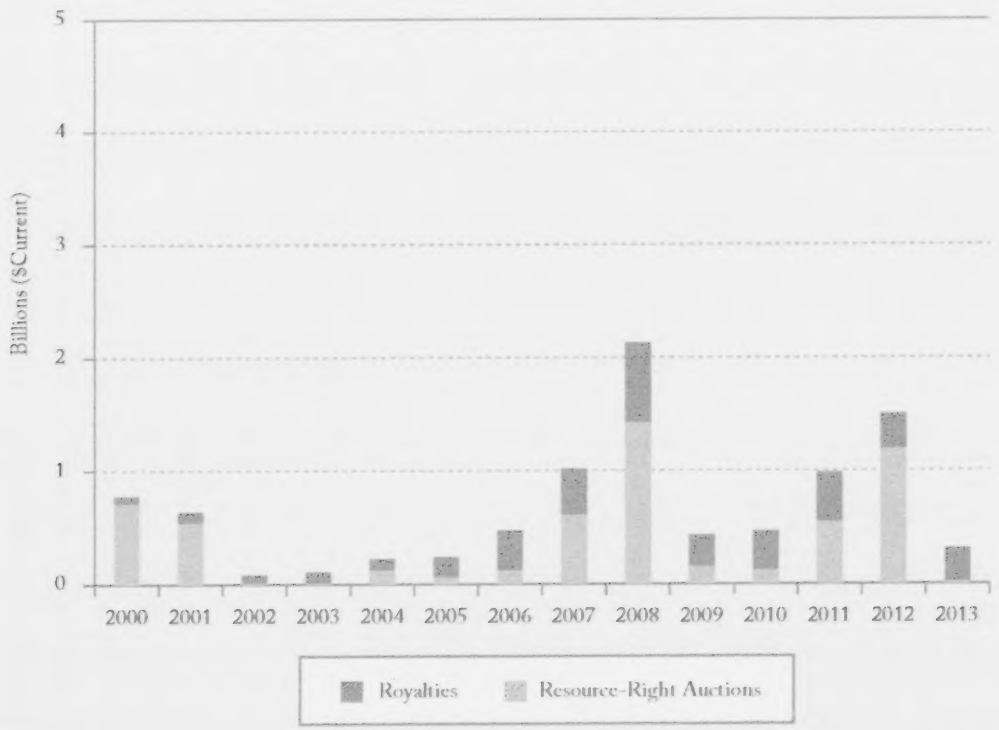
Public participation: Governments can claim a share of public ownership when they grant a licence to a private producer. The public partner shares both cash flows and risk, and influences decisionmaking. The share of ownership determines the share of rents and taxes. In the extreme, public participation could be 100 percent, making the resource firm a public one.

Rent taxes: Cash-flow taxes apply to all revenues less costs measured on a cash rather than accruals basis. Under certain circumstances, the present value of cash flows is equivalent to the present value of rents. Following standard practice, we refer to cash-flow-equivalent taxes as rent taxes.

Auctions

Competitive auctions are, in principle, the purest and most efficient revenue-raising instrument. In an ideal world, the winning bid for a resource property should be close to the full value of expected rents, or above-normal returns. Unlike public participation and rent taxes, auctions can separate rents from

Figure 5: Oil and Natural Gas Revenues in the Rest of Canada, 2000-2013



Source: : Authors' calculations from CAPP.

normal returns inclusive of a risk premium. Auctions have no effect on later production decisions, making them economically neutral.

However, achieving this efficient ideal is demanding. While competition is crucial to the effectiveness of auctions, it can be difficult to achieve in a context with relatively few firms and the possibility of collusion. There are also auction design issues, such as the size of properties being auctioned, the timing of sales and whether to auction parcels simultaneously or sequentially. Ideally, auctions should be done at the beginning of the production process, before exploration has commenced, and all parties should be equally well informed at the time of bidding.

These issues are relevant given that information revealed about one property may be valuable for nearby properties. There may also be the potential for scale economies in nearby exploration and development. Leases should be of long duration and tradable, given the length of the gestation period in developing resource properties and the fact that more than one firm can be involved between the exploration and extraction stages.

Auctions favour single bidders rather than partnerships or consortiums because partnerships

can run into hurdles of information- and risk-sharing that would be necessary for bidding. The amounts that companies bid in auction reflect normal and political risks along with known future taxes. Bidders also take into account the risk of unexpected or uninsurable shocks. All these risks considerably erode auctions' revenue-raising potential. Moreover, political risk can include not just the risk associated with future tax rates, but also uncertainty about future government infrastructure investments that can have a major impact on the value of rents.

Not surprisingly, as a result, most governments employ other revenue instruments in combination with auctions. However, some countries do not have any auctions, an important example being Norway.

Public Participation

Norway is the poster child for non-renewable resources policy. Some estimate that it captures up to 90 percent of resource rents for the public sector (Lund 2014). In addition to having a rent tax, Norway relies on public participation as an alternative to auctions for resource exploitation rights.

Licences are awarded by "beauty contest" rather than competitive bidding. The government invites proposals and chooses the winner based on the quality of the proposal. Licences are conditional on a public firm taking an ownership share and, therefore, sharing in costs and revenues as well as in decisionmaking.

Public participation is not unknown in Canada. Historically, it was used in Saskatchewan through SaskOil and the Potash Corporation and federally through Petro-Canada, all of which were once Crown corporations with 100 percent public participation. Ontario once owned as much as 25 percent of what became oil company Suncor in the 1980s and 1990s, with additional terms that would have earned it full control if the company did not transfer majority ownership to Canadians (George 2012). Public partnerships are currently used in Newfoundland and Labrador where Nalcor Energy is actively involved in oil and natural gas, hydroelectricity and wind power projects.

Public-private partnerships have several advantages. From the government's perspective, the stream of profits they receive from a project is equivalent to a cash-flow tax with full loss-offset, including for projects that turn out not to be profitable. Public-private partnerships mitigate political risk since the public sector would share in the benefit of resource price increases. Public-private partnership also makes it difficult to shift profits through transfer pricing and gives governments more information about company activities. This is especially true when there are multiple private partners since profit-shifting requires coordinated efforts.

The main public-private disadvantage is that it entails a substantial public sector role in production decisionmaking, which can give rise to incentive and administrative efficiency problems that dampen the private profit motive. Presumably, these concerns are lessened to the extent that public participation is less than a controlling amount.

The degree of political interference can range widely. Norway has historically had little government interference in operations, a practice that may be changing as a result of recent elections (Mohsin and Holter 2014). At the other extreme, Venezuela's experience of state interference in its oil producer, Petróleos de Venezuela, S.A. (PDVSA), has led to major mismanagement and declining profits available to the state.

Rent Taxes

Rent-type taxes, or cash-flow equivalent taxes, apply to natural resources in many jurisdictions, including some Canadian provinces. However, they are rarely close to pure rent taxes. For one thing, it is difficult to separate rents from other elements of profits, including normal returns to shareholders and risk premiums. For another, deductions for

investment expenditures are often inadequate because firms cannot use them in all circumstances, such as upon windup.

The classic cash-flow tax, originally advocated by Brown (1948) and proposed by the Meade Report (1978) in the UK, is based on cash revenues less cash expenditures, including investment purchases. A cash-flow tax would treat negative cash flows symmetrically with positive ones, including for firms that wind up. It is equivalent to a combined tax on rents and returns to risk, since tax authorities cannot distinguish between cash flows attributed to risk and those from normal risk-free returns.

However, since many firms are risk averse and, therefore, require a premium to compensate for the cost of assuming risk, a cash-flow tax is not neutral. By assuming a fixed share of both positive and negative cash flows, the government is effectively sharing in the risk.[8] The result is that governments encourage risk taking with a cash-flow tax.

In resource industries, cash-flow taxes typically generate negative revenues for government during the exploration and development stages and, later, positive revenues when cash flows become positive. Given the reluctance of governments to provide full refundability of losses, they often provide alternatives such as allowing firms to carry losses forward indefinitely with interest.[9]

There are other alternatives that yield equivalent revenues to cash-flow taxes in present-value terms. One is a capital account allowance tax (Boadway and Bruce 1984; Boadway and Tremblay 2014). Instead of deducting investment expenditures immediately, firms put them into a capital account and depreciate them gradually. Depreciation is deducted as well as a risk-free cost of finance applied to the capital account. If the firm winds up with some undepreciated capital in the account, governments must refund the associated tax loss. Then, the present value of the tax base is equivalent to the present value of cash flows, and the tax is equivalent to a tax on rents plus returns to risk.

Two other cash-flow-equivalent tax systems have been proposed. One is the allowance for corporate equity tax, which many studies have recommended as a corporate tax for the EU, US, UK and Canada (Institute for Fiscal Studies 1991; President's Panel 2005; Mirrlees Review 2011; Boadway and Tremblay 2014). Such a tax has been implemented in Belgium, Brazil, Croatia and Italy (Klemm 2007). The allowance for corporate equity tax is a straightforward variant of the corporate tax: the only difference is a deduction equal to the risk-free interest rate times the share of the book value of capital financed by equity.

As with the corporate tax, there is a deduction for depreciation as well as for interest on debt. If the firm paid the risk-free interest rate on its debt, the allowance for corporate equity would be equivalent to the capital account allowance and would be a tax on rent plus the return to risk. It will differ from the capital account allowance to the extent that the interest rate reflects a risk of bankruptcy or includes some rents in capital markets (which is unlikely given competitive capital markets). The risk-free rate is appropriate if there is no risk the government will renege on its promise to refund losses (Boadway 2014).

The second cash-flow equivalent tax is the resource-rent tax, recommended for Australia's mining industry by the Henry Report (2010). The resource-rent tax differs from a cash-flow tax in that

8 See summaries in Atkinson and Stiglitz (1980), and Buchholz and Konrad (2014).

9 Flow-through shares are one approach to dealing with the refundability problem. However, among other problems with these systems that we will not discuss here, they typically apply only to the corporate tax rather than rent taxes.

negative cash flows are not refunded, but are carried forward at a risk-free interest rate. Once positive cash flows are sufficient to offset accumulated negative ones, they become fully taxed.

In sum, to be equivalent to a true cash-flow tax, cash-flow equivalent taxes must allow firms that wind up with tax losses owing to have those losses refunded. Such a provision is rare, an exception being the Norwegian petroleum tax.

While our concern is with the taxation of natural resources, rent-type taxes could be applied to the corporate tax regime more generally. In the event that rent taxes were adopted as the corporate tax in Canada, they could in principle be harmonized with provincial natural resource taxes through tax collection agreements that allow for differential rates between resource industries and others.

Pitfalls in Practice

The best practices summarized above have long been known. Despite that, they are seldom adopted in Canada and elsewhere. That may be due to a lack of political will. However, there are a number of factors that constrain resource-tax design, or at least make it more difficult for policymakers to adopt systems that are both efficient and obtain a significant proportion of rents for governments. We focus on five main obstacles: asymmetric information between taxpaying firms and the government; the failure to properly account for risk and loss-offsetting; the inability of governments to commit to policies over a long-time horizon; the absence of an appropriate tax rate; and the administrative difficulties of setting up such a tax, particularly in a federation like Canada.

Asymmetric Information

Taxation is based on self-reporting, backed up with auditing and enforcement. There are many well-known collection problems faced by such a system when applied to business taxation, particularly for international businesses. Firms are able to avoid taxes by profit shifting, using transfer pricing and intra-firm financial transactions, and by routing income through low-tax countries.

These problems are particularly challenging for government monitoring of the resource industry, given the prominence of multinational firms that are vertically integrated and sell their products worldwide. As a result, gross-revenue royalties have an advantage over profit taxes in that they are not prone to international profit-shifting using transfer pricing, financial transactions or establishing offshore establishments in low-tax jurisdictions.

A particular problem in resource-tax compliance is that tax authorities are better able to observe production or sales than to observe costs. This may account for the use of production-based gross-revenue royalties rather than profit-based taxes, especially in oil and natural gas industries. Arguably, auctions and public participation arrangements avoid asymmetric information issues to a large extent. With auctions, there is no need for the government to know costs. With public participation, public firms are presumably willing to cooperate in reporting on themselves and their private partners.

Risk and Loss-Offsetting

Rent-tax regimes cannot separate returns to risk from rents. Given the sizable failure rate among upfront resource investments and the volatility of prices, loss-offsetting is imperative so that the resource tax does not discourage risk taking. Full loss-offsetting implies that the government shares the risk, but it may be reluctant to do so, especially if refundability is required.

This may partly account for the use of gross-revenue royalties for which loss-offsetting is irrelevant, unless gross-revenue royalties are creditable against future rent taxes, as is sometimes the case. Since gross-revenue royalties apply asymmetrically to positive, as opposed to negative, cash flows, they discourage risk. Note that auctions are immune to this problem since the government

does not assume risk, while public participation effectively allows immediate loss-offset.

Firms that are large enough can implicitly refund losses by pooling positive and negative cash flows. If the resource tax applies on a project-by-project basis, this "ring fencing" removes the refundability advantages of large firms and may, therefore, be detrimental to rent taxation. Governments apply ring fencing to project costs to prevent companies from shifting costs from one project to another to avoid taxes. This is akin to the common practice of transfer pricing.

However, it may make sense for companies to offset resource-extraction-related costs from one project to another, including certain administrative expenses. More problematic would be for companies – especially vertically integrated or multi-sector conglomerate corporations – to deduct non-resource-extraction-related costs. Site-specific ring fencing is an administratively feasible approach to this problem, but not necessarily the economically correct one given that off-site administrative costs matter for business as well.

Ring fencing is easy to do for large or offshore projects. Doing so for smaller, conventional wells is subject to more vagaries such as defining which shares of communal investments or mobile workers apply to which site. However, oil and natural gas extraction is now often on a small site with multiple horizontal wells. That may make ring fencing of conventional extraction expenses for the purposes of a cash-flow equivalent tax more feasible because they are becoming more self-contained large-scale drilling operations than in the past. One example is the BC Net Profit Royalty Program, which applied a cash-flow tax to shale gas wells in Northeastern BC for a short period of time.[10]

The Tax Rate

The choice of a tax rate and how it should vary with resource prices is a vexing problem. In the case of a rent tax, one might think the rate should be as high as possible, given that the object is to maximize government share of rents. To the extent that higher tax rates encourage profit-shifting through tax planning, lower tax rates might be unavoidable. Provinces sometimes worry about tax rates being competitive, although it is not clear how important that is if taxes are based on rents. Since resources are fixed in location, normal tax competition effects do not apply. Gross-revenue royalty rates are typically lower than rent taxes because they are a more inefficient revenue vehicle and because they do not allow costs to be deducted.

The ideal relationship of a rent-tax rate to resource prices is also a difficult question. A fluctuating rate encourages firms to incur costs when their profits and tax rate is high (Sandmo 1979). A low tax rate at times of low prices, as we see now, would mean that companies would have less incentive to take on costs because they would only yield a small tax benefit. These combined effects could exacerbate the boom and bust cycle of resource regions (Mintz and Chen 2010). On the other hand, if the price rises unexpectedly due to a permanent change in world prices rather than as a result of random and temporary fluctuations, a higher tax rate may be appropriate.[11]

The implication is that when prices are subject to random fluctuations, there is no need for the tax rate to vary with resource prices. On the other hand, tax-rate changes may be a justified response to a permanent or long-lasting resource price shock. In practice, it is not discernible if a price change is random or due to a permanent shock. Prudence

10 See http://www.empr.gov.bc.ca/OG/oilandgas/publications/Documents/Frequently%20Asked%20Questions.pdf.

11 See, for example, Lund (2002) and Dahlby (2013).

suggests maintaining the tax rate as fixed unless it is clear that the price change is long term. Otherwise, the tax system imposes unnecessary risk on the firms.

Commitment Problems

Given the long-run nature of resource production and the volatility of prices, governments may be unable to make long-term rate-structure commitments, especially since they often change every few years. Indeed, governments usually succumb to the temptation to change tax rates, especially if resource prices change, even if the price change is random or cyclical. The temptation arises because firms have already undertaken irreversible investments, so an increase in the tax rate can capture some of the returns from the extraction phase (called quasi-rents) without discouraging investment.

The inability to make long-term tax-rate commitments gives rise to political risk. When there is a fear that governments may increase tax rates, it reduces the return that firms expect to earn and reduces the incentive to undertake upfront exploration and development investment. The problem of commitment to a tax regime is particularly important for gross-revenue royalties whose rates are readily adjusted when resource prices change. The insecurity can be mitigated by governments imposing royalty-rate schedules that increase with resource prices. However, that does not avoid the problem: it simply makes the rate structure explicitly more discriminatory to risky outcomes since the absence of commitment discourages investment and reduces the ability of governments to capture rents. The result is that governments and the public then believe – rightly or wrongly – that gross-revenue royalty rates seem to be relatively low.

Commitment is less of a problem for rent taxes. The economics literature has established that if governments use fully non-distorting tax instruments, they will want to commit to that policy. That is because companies expect that governments then would have no incentive to raise or change the tax rate because they cannot take a higher share of profits.[12]

Meanwhile, if firms were risk neutral, a cash-flow tax would be a non-distorting tax on rents and would not be subject to commitment problems, at least with respect to random changes in resource prices. In the case of an unexpected resource price shock – it is unclear if the current drop in oil prices is a long-term decline or short-term drop – for which the committed tax rate is not suitable, it would be reasonable to adjust the tax rate appropriately. Commitment is not then an issue.

However, risk neutrality may not exist in practice: even a cash-flow tax with full loss-offsetting affects firm behaviour since it taxes the return to risk and, therefore, is not a non-distorting tax. When part of the return on investment consists of rewards for risk taking, the government will be tempted to increase the rent-tax rate when prices are high, which in turn will discourage risk taking. Under either capital account allowance, allowance for corporate equity or resource-rent tax systems, uncertainty about future tax rates is a source of political risk that translates into uncertainty about the value of tax losses carried forward. To address that issue, the interest rate applicable to carry-forwards – the uplift rate – can be increased to reflect the political risk.

The issue of commitment under auctions is an open question. Political risk here reflects the fact that rents depend on future government policies, including infrastructure spending and public services that support resource exploitation.

12 The argument is a technical one and is discussed in Boadway and Keen (2015).

The effect of these policies on rents is potentially significant. If auctions are conducted before all such policies are in place, the value of competitive bids will underestimate future rents and will fail to result in a reasonable share of rents on publicly owned resources accruing to the public sector.

Provincial governments may feel more subject to fiscal competition pressures than a federal government would, given that the provinces compete with one another. Indeed, Alberta, for one, worries about maintaining a competitive resource tax regime. Standard notions of tax competition are based on the idea that a unilateral decrease in the tax rate in one jurisdiction will attract mobile factors of production from others. Natural resources are fixed in location and not mobile, so if a rent tax were in place, one might not expect tax competition. As long as the tax does not apply to the normal return on mobile capital, resource production should not be unduly discouraged.

Administrative Difficulties

Canadian resource-tax practices are far from optimum, partly because administering cash-flow taxes is difficult since measuring costs is challenging. Tax authorities also have difficulty in determining the correct interest rates that companies should use for determining a normal rate of return. When governments allow carry-forwards with interest, it is often at an excessively generous interest rate, given that little risk is involved. If there is little risk that carry-forwards will not be honoured, the uplift rate should be the risk-free interest rate, not the cost of funds to the firm. The latter generally incorporates an appropriate risk premium.

On the other hand, some governments, such as Newfoundland and Labrador, do not allow companies to carry forward previously paid gross-revenue royalties with interest. Such gross-revenue royalties would be non-distorting only if companies could carry them forward and refund them later. There may also be processing allowances, but they are typically set using rules of thumb such as a certain amount based on the depth of wells but not actual costs. Resource taxes combined with the corporate tax generally result in positive marginal effective tax rates and these vary considerably across provinces (Chen and Mintz 2013).

Compliance is complicated by the fact that resource firms are liable for both resource taxation and corporate taxation, and must report different tax bases to more than one tax authority. These various shortcomings of resource-tax design and administration may account in part for the fact that Canadian resource-tax rates, whether profit taxes or gross-revenue royalties, are relatively low compared with, for example, the Norwegian benchmark.

While federal and provincial corporate taxes also apply to resource industries, they use broader tax bases. Corporate taxes have long been recognized as being inefficient: they distort investment and risk taking and encourage leverage, as documented in the Mintz Report (1997). If the federal government introduced an allowance for corporate equity, the resulting corporate tax base would be similar to rent-based resource-tax bases. It would also open up the possibility of harmonization of corporate and resource taxes.

Currently, the co-existence of the federal and provincial corporate taxes with provincial resource taxes not only leads to compliance issues but also compounds the inefficiencies inherent in both taxes. There is an uneasy relationship between them reflected in the deductibility of provincial resource taxes from the corporate tax base, which serves to redistribute tax revenues from the federal government to resource-producing provinces. There is no compelling reason for that redistribution given the commitment the federal government has to equalize differences in revenue capacity among provinces arising largely from resource revenues.

One final issue, broader than administrative issues, concerns provincial governments' use of resource revenues. Regardless, the ways in which

governments spend resource revenues is separate from how they collect the money.[13]

Policy Implications

Norway's rent tax with full loss-offset, Australia's successful Petroleum Resource Rent Tax and BC's net-revenue mining tax illustrate the feasibility of implementing rent taxes on resources that approximate cash-flow taxes. These can be combined with complementary instruments, such as competitive auctions, and applied to a number of Canadian oil and natural gas tax regimes.

Reforming Provincial Resource Taxation

Provincial resource-tax systems are currently a mix of rent-type cash-flow taxes and gross-revenue royalties that differ among provinces and among resource types. Resource firms are also subject to corporate income taxes on shareholder income, including both normal risk-adjusted profits and rents, though with fairly generous deductions for exploration and development expenses. The result is a tax system that distorts investment decisions of all sorts, discourages risk taking and does not capture as large a share of rents as under an efficient system.

Resource taxes should be as closely based on rents as possible, and that can be achieved by a cash-flow equivalent rent tax with loss-offsetting. The simplest approach is a cash-flow tax whose base is revenues less all expenses deducted in full. Refundability of losses can be largely avoided by carrying forward tax losses with interest. The interest rate should be the risk-free one unless the government might not make good on all losses. In a perfect world, all losses would eventually be refundable, though in practice that might be difficult if losses cannot be refunded when a business winds up. However, that difficulty could be minimized by allowing losses to be transferrable when businesses change hands.

Meanwhile, allowing full refundability of losses of firms that wind up may not be wise, given the possibility of tax fraud. To recognize this, the interest rate on tax losses carried forward could include a political risk premium, although not as high as the 25 percent in some provincial mining-tax systems, such as that in BC. The system just outlined is equivalent to the resource-rent tax system with the appropriate interest rate on negative cash flows.

Provinces should avoid the existing practice of implementing gross-revenue royalties upfront that are creditable against future rent taxes. While that generates an early flow of revenue, it also creates carry-forward losses that may not all end up being creditable. Governments could instead collect immediate cash flow from higher auction revenues, which Busby, Dachis and Dahlby (2011) find would roughly replace the money lost through lower gross-revenue royalties.

To obtain a reasonable share of rents, to simplify tax administration and to minimize avoidance activities, the resource tax rate should be sufficiently high, uniform and constant over time. The system should be complemented by competitive auctions, recognizing that the higher the tax rate, the less revenues auctions would yield. However, auctions have the advantage of extracting rents without taxing risk and causing refundability problems.

Such a tax-auction system would apply to resource production from exploration to extraction on a firm basis (as opposed to a project basis). Since exploration and extraction may well be done by different firms, the rent tax should apply to both. If so, there is no need for it to apply downstream at

13 This matter is discussed elsewhere (Shiell and Busby 2008; Landon and Smith 2010).

the processing stage. Specifically, that means there should be no need for a special rent tax on liquefied natural gas plants as proposed by BC, given that a rent tax has been applied on the exploration and extraction stages.

Reforming Federal Taxation

An ambitious complement to rent taxes for resource industries would be to replace federal, and thus most provincial, corporate and personal unincorporated business income taxes with rent taxes.

There are sound arguments for doing so as discussed in Boadway and Tremblay (2014). One is that the standard role of the corporate tax as a withholding tax at source against shareholder income is no longer relevant when a high proportion of shareholder income is sheltered from personal tax. Furthermore, the corporate tax is largely shifted away from shareholders when rates of return are set in international capital markets.

A second is that the corporate tax unnecessarily distorts investment decisions. Finally, evidence suggests that there are significant rents in the corporate sector (de Mooij 2011). The corporate tax could be relatively easily transformed into an allowance for corporate equity tax by introducing a deduction for equity finance. One could also do away with integration devices (dividend tax credits and preferential capital gain taxation) at the same time since they would serve little purpose.

An option for the corporate tax that would be simpler in the long run would be to change it to a cash-flow tax, allowing carry forward of negative cash flows with interest. An advantage of such a system would be that the corporate tax and resource taxes would be harmonized and could be administered by a single agency like the Canada Revenue Agency.

This would mitigate the asymmetric information problem that provincial tax administrations can face when dealing with large resource firms. Like the federal-provincial corporate tax collection agreements, provinces would be able to set separate resource-tax rates on the common rent tax base. There would be no need to deduct provincial resource taxes from the corporate tax base. The same cash-flow tax could be applied to unincorporated businesses.

Conclusion

Overall, the best result for Canada would be a business tax system that is as non-distorting as possible and that allows governments to capture as large a share of rents as possible. Applying taxes to rents sidesteps competitiveness concerns since investing firms can earn a normal rate of return on their investments. As policymakers in Canadian provinces review their resource taxation, they should take a global look at resource taxation. They should not look only at Canadian oil and natural gas taxation regimes, but also at Canadian mining regimes.

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